Visualizing Immunization Logic in a Rule-Based Expert System

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The poster demonstrates an approach to visualizing logic in a knowledge-based system. Our goal is to help domain experts examine logic in an expert system for childhood immunizations. The presentation is domain-specific and models underlying immunization guidelines as closely as possible. We show several examples of childhood vaccine recommendations, and discuss lessons learned from this effort.

For each immunization series, a temporal framework is central to the logic and thus the visual model. These temporal components include 1) age intervals for which the vaccines are acceptable, recommended, and past due, 2) number of doses recommended, and 3) necessary time intervals between doses. Several vaccines have multiple schedules to compensate for effects of starting vaccines later than recommended.

We developed a "visual vocabulary" to express the guideline logic (Figure 1). Symbols represent key aspects of the domain. A small amount of textual material is used along with these symbols to avoid confusing complexity in the presentation.

Figure 2 shows an example of the model as applied to the *Haemophilus influenzae* type b (Hib) immunization. This figure displays the entire Hib logic. The visual model was used for all six childhood immunization series covered by an expert system (IMM/Serve).

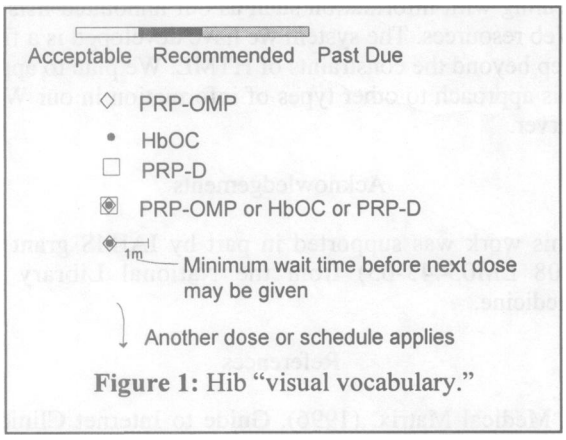

Figure 1: Hib "visual vocabulary."

Translating immunization guidelines into visual models raises several important points: 1) intended purpose influences the choice of presentation, 2) visualization results in a better understanding of the underlying logic, 3) there is a tradeoff between visual and textual explanation, and 4) domain-specific visualization is advantageous.

SUMMARY

Our goal was to examine the utility of translating guideline logic into a visual format. Creating a visual model and applying it to all six vaccine series has resulted in a better understanding of the logic by the system developers. By exposing fine distinctions and potential inconsistencies in the logic, this general approach should allow improvement in the completeness and conciseness of computer-based logic in other clinical domains beyond immunization.

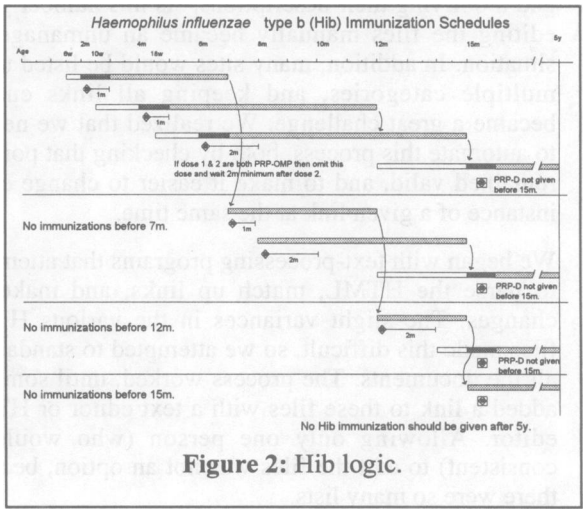

Figure 2: Hib logic.